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Addendum

Contribution by local authorities**

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I. Introduction

1. Local governments are key stakeholders in the implementation of Agenda 21 and the achievement of the Millennium Development Goals. They are directly impacted by the way in which sustainable development is addressed in the thematic areas of sustainable consumption and production, transport and waste.

2. Sustainability calls on us to address the interdependence between economy, society, ecology and good governance. Consequently, we must address the impacts of the global financial markets and climate change on the global world order and specifically on sustainable development within the context of the themes of the eighteenth session of the Commission on Sustainable Development.

3. Cities concentrate people, goods, capital investments, infrastructure and knowledge. Urban areas have a profound influence on the nature and extent of resource use and resource flows, in cities themselves and throughout the world. More than half of the global population now lives in cities. It is predicted that by 2030 about two thirds of all people will live in urban communities. Sustainable consumption and production patterns are necessary to serve the (urban) population in the very near future. The way cities consume through their procurement policies are of utmost relevance in this regard.

4. Urban form and the density of settlement determine the demand of an urban population for transport and waste disposal. Smart solutions are necessary to keep up with the rise in urban population.

5. The present paper evaluates progress on the above-mentioned areas from the perspective of local authorities, showcases good practices, identifies some of the constraints and obstacles to success and offers some conditions needed for effective implementation.

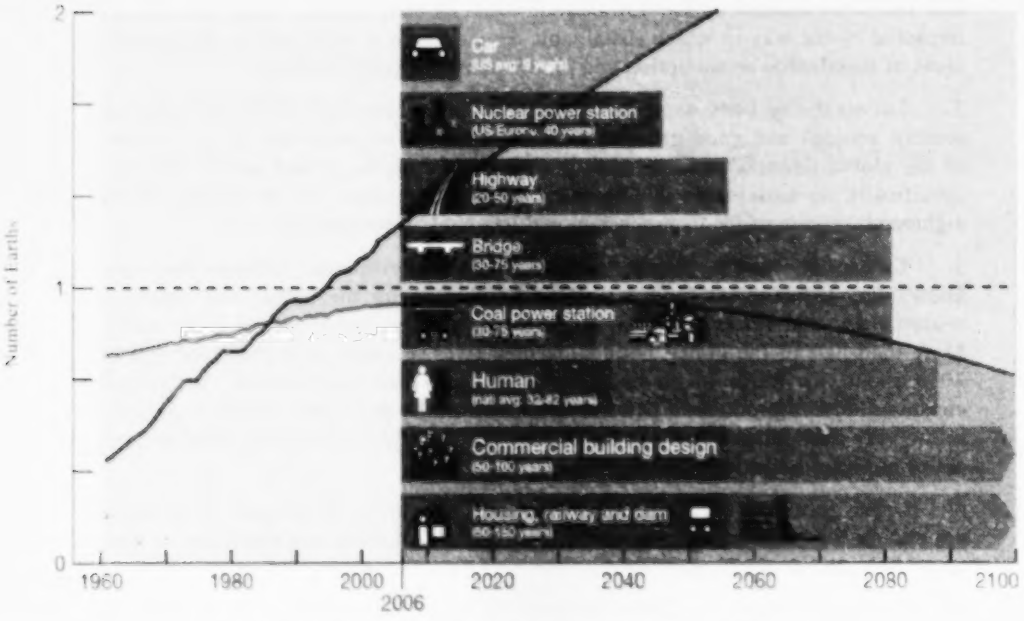
II. Sustainable consumption and production

A. Background

6. Consumption and production are key levers to attain a more sustainable development: unsustainable consumption patterns are major causes of global environmental deterioration, including the overexploitation of renewable resources and the use of non-renewable resources, with their associated environmental impacts.

Figure I shows that investments and purchases determine the future.

Figure I
Investments determine the future



Source: M. Wackernagel, "Peak Everything" Global Footprint Network (2009).

7. Local authorities form the level of government closest to the people. Cities should lead by example through the reduction of their carbon footprint. The way cities consume or purchase can set this example; cities should put sustainable procurement policies into place. One of the key areas of sustainable consumption and production, which local authorities can play a role in, is sustainable procurement.

B. Green and sustainable procurement

8. Sustainable procurement addresses the following aspects:

- Thinking carefully about what one purchases
- Purchasing only what one really needs
- Purchasing products and services with high environmental performance
- Considering the social and economic impacts of procurement.

9. One of the key issues is the difference between green procurement and sustainable procurement. Green procurement focuses only on the environment, whereas sustainable procurement focuses on environmental, social and economic aspects.

10. At the international level, the United Nations Secretary-General has emphasized the need for United Nations organizations to lead by example in

reducing the carbon footprint of their operations. The United Nations Environment Programme (UNEP) is developing purchasing guidelines for United Nations procurers through its Sustainable United Nations (SUN) initiative, and has underlined its commitment by joining the Procura+ Campaign.

11. At the European level, a strong emphasis is being placed on promoting green public procurement, through, for example, setting ambitious political targets for member States and the publication of a green public procurement training toolkit containing purchasing criteria recommendations. A focus is also being put on reaching European consensus on minimum environmental standards for certain product and service groups.

12. At the national level, for Europe at least, many countries have now introduced voluntary national action plans for green public procurement.

13. Green public procurement is now seen as a mechanism to achieve a number of wider objectives than simply tackling the environment and accelerating the transformation of the market. These include:

- Providing long-term economic stability, stimulating green growth, supporting small and medium enterprises, thereby driving business competitiveness
- Improving the quality and efficiency of public services
- Encouraging innovation
- Making regions more competitive.

14. There is also a renewed focus on how the procurement process itself can best be used/adapted to encourage sustainable solutions, including:

- Pre-tendering early market engagement
- Pre-commercial procurement
- Outcome-based procurement.

15. Within the European Union and internationally, the introduction of new policies and strategies related to green public purchasing over the last 3 years is indicative of strengthening political support and is providing an increasingly encouraging legislative framework for implementation. Some national Governments and public authorities in developed countries are committing themselves to develop green public procurement strategies and are buying green themselves.

16. However, significant differences remain between developed and developing countries in the level of political support for green public procurement and in the actual application. There has been an increase in awareness but we are increasingly finding that moving from policy to action is more deep-rooted than just raising awareness, having criteria and tools. The knowledge and skills necessary to undertake sustainable procurement are not sufficiently widespread.

17. Gaps of knowledge and interaction exist between policymakers and procurers and between the public and private sector. We need to take a step back and look at what we have done and look at what is working and what isn't. A number of steps remain to be undertaken to really ensure we are moving from policy to action. Among others, there is the opportunity to harmonize many initiatives in the green

public procurement field, to develop appropriate support structures put in place further support for knowledge transfer.

C. Sustainable procurement in urban areas

18. The Marrakech Process is a global process to support the elaboration of a 10-year framework of programmes on sustainable consumption and production, as called for by the Johannesburg Plan of Implementation adopted at the World Summit on Sustainable Development. As part of the Marrakech Process Task Force on Sustainable Public Procurement an implementation model for sustainable public procurement was developed, which is currently being tested in six countries. The goal of the Task Force is for 10 per cent of countries in all regions of the world to have sustainable public procurement programmes in place by 2010.

19. The Task Force is looking with representatives from local governments at how the model could be used by local authorities. It is important to recognize the potential of cities in creating sustainable lifestyles. Cities cover just over 1 per cent of the Earth's surface, but consume almost 70 per cent of the world's energy. Cities are the main polluters in terms of carbon dioxide (CO_2) emissions. Consumption and production in cities form the potential for sustainable patterns.

20. There are good examples of sustainable procurement by cities. But the number of good practices among cities (and national Governments) is still relatively low.

Examples of sustainable procurement in cities:

- Malmö city is converting its school meals to become 100 per cent organic, cutting transport demand and increasing the base for regional food.
- All Barcelona's cleaning services, worth 16.2 million euros, use non-toxic products.
- Kolding has changed virtually 100 per cent of its purchasing practices to include environmental considerations.
- Zurich, Switzerland, purchased 2,166 energy-efficient computers, through which 127,114 kg CO_2 was saved during their use. Zurich also used energy efficiency and sustainable building materials criteria for 45,081 m^2 covering contracts worth 175.1 million euros.

D. Recommendations

1. Focus on sustainable procurement in cities

21. Cities can create a high leverage owing to the high population density and thus the highest consumption rates. National and local governments should support initiatives such as Procura+ of the ICLEI-Local Governments for Sustainability. Procura+ is designed to help support public authorities in implementing sustainable

procurement and help promote their achievements. Currently 28 participant cities and public authorities have joined (see www.procuraplus.org).

22. The Local Authorities Major Group supports the participation of local authorities in planning, decision-making and implementation within the 10-year framework of programmes, as suggested in the third draft input from the Marrakech Process.

2. Create more awareness of cost benefits of sustainable public procurement

23. The most commonly used argument against sustainable public procurement is that green products cost more. However, upon closer inspection, this generalization does not hold true. Undertaking sustainable public procurement should in the medium term be cost neutral and in the longer term actually save money. In many cases, the greener alternative is even available at the same purchase price as standard products, or at a marginally higher price. It is often the case, though, that the green product costs slightly more than the standard alternative, as the price will often include a premium for new technologies and design, and for many products economies of scale have so far not been achieved. Yet the real cost of a product for the buyer is much more than simply the purchase price paid by a procurer. In order to decide which alternative is the cheapest, the costs throughout the product's life cycle must be considered, namely, the costs of purchasing, operating and maintaining, and disposing of the product.

III. Transport

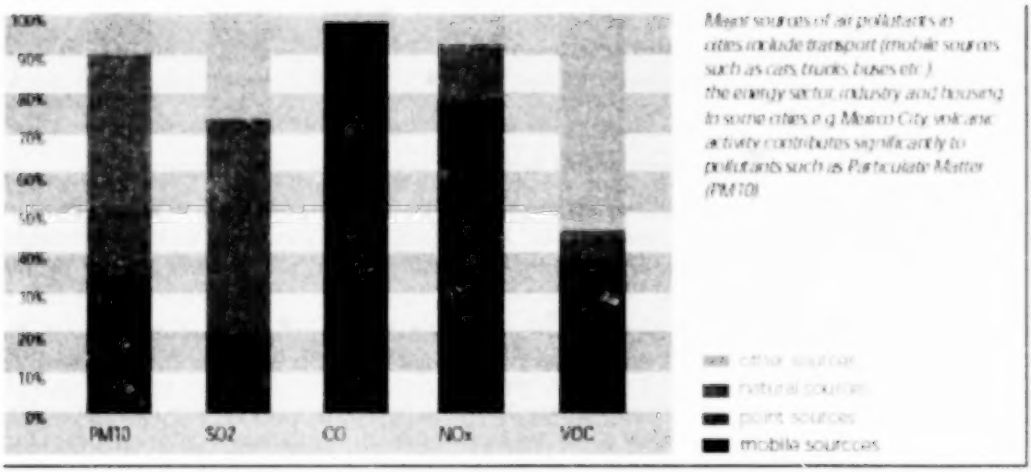
A. Background

24. Transport is a key economic sector, which supports economic development and growth in our cities, and facilitates exchange. However, the transport sector is also a significant and growing contributor to greenhouse gas emissions, traffic congestion and motor vehicle accident rates. It must be clear that in order to avoid dramatic environmental damage, significant reductions in greenhouse gas emissions from all sectors are required, including the transport sector, which is responsible for 23 per cent of world CO_2 emissions from fossil fuel combustion.

B. Transport in urban areas

25. Owing to the fact that more than half of the world's population lives in cities, transport is highly relevant in urban areas. As seen in figure II, the majority of the urban emissions come from mobile sources (such as cars, trucks, buses, etc.). In Organization for Economic Cooperation and Development (OECD) member countries transport's share of CO_2 emissions from fossil fuel combustion is even higher at 30 per cent.

Figure II
Urban emissions sources



Source: German Agency for Technical Cooperation, 2004.

26. Some 95 per cent of the transport sector is dependent on oil and accounts for 60 per cent of oil consumption worldwide. This also makes urban transport increasingly vulnerable to oil price instability and supply shocks (Energy Information Administration, 2007).

27. Beyond the limitation of fossil fuel resources and the impact transport has on climate change, almost all megacities of the developing world are also facing transport sector problems related to high local noise and pollution levels, a high level of traffic congestion and inappropriate land use changes causing losses of biodiversity and agricultural land.

28. Urban sprawl policies from the United States of America and many European countries are still spreading to developing countries, narrowing their policy alternatives for sustainable mobility structures. Once residential areas, schools, health facilities, shopping centres and leisure facilities have spread into the outskirts of cities, the private automobile seems to be the logical and only mobility choice, encouraging broader urban streets, circular ring-roads and highways, which leads to a vicious circle of car-dependent development.

29. Against this background a business-as-usual development in the urban transport sector is no longer acceptable. Unsustainable investments in transport infrastructure and car-dependent spatial planning will last for decades and would obviously lead to a critical and nearly irreversible economic and social situation in the affected cities. Therefore, the "transport question" must be placed high on the political agenda and it is necessary to call for actions both in developed and developing countries.

30. Europe and the United States are trying to address urban transport issues more seriously, but transport-related emissions continue to increase in those regions. Unfortunately, current political discussions about Europe's transport sector tend to concentrate on technical, supply-side options for the mitigation of CO_2 emissions, and not enough focus is placed on policies related to transport demand reduction. Also, the United States and other OECD countries have not included transport in

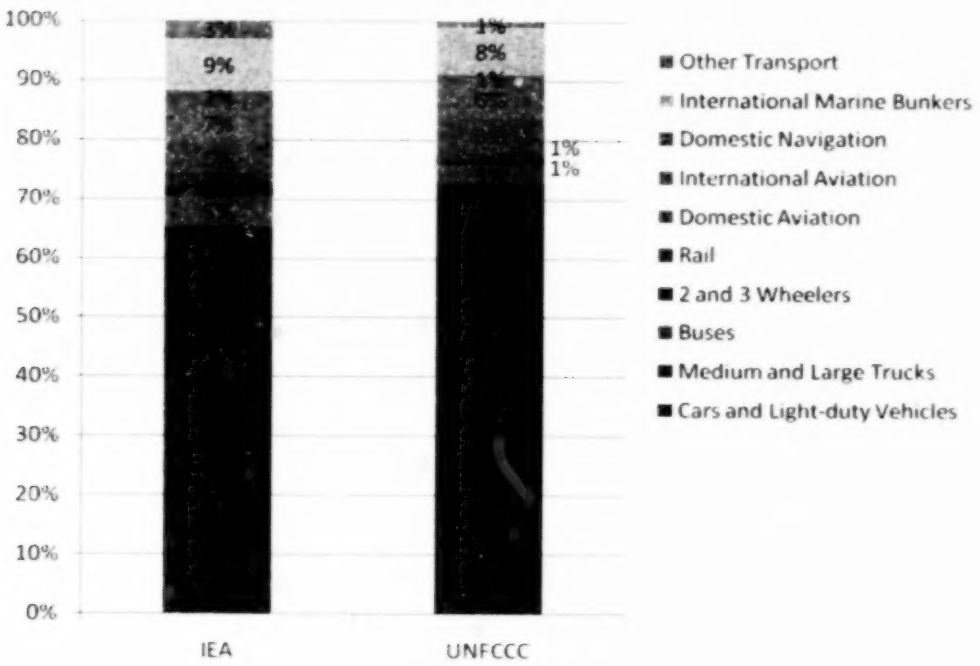
their greenhouse gas emissions-reduction efforts and a paradigm shift in urban mobility planning is still out of sight.

C. Transport sector emissions

31. Figure III displays the breakdown of CO_2 emissions by mode within the transport sector from two different sources (IEA and national reports to the United Nations Framework Convention on Climate Change). Although estimates vary, both sources paint a similar picture of modal share of transport emissions.

32. Car and light-duty vehicle transport produces up to half of all transport sector emissions, and overall, emissions from road transport produce about three fourths of all transport emissions. Cars, obviously, are a major mode of urban transportation in developed countries and a growing sector in developing countries. Although motorized two- and three-wheelers provide a relatively small percentage of emissions worldwide, it should be noted that these vehicles are a major part of traffic in many emerging cities. They provide essential mobility to low- and mid-income families but add to traffic congestion, accidents and local air pollution (International Transport Forum, Leipzig, 2008). Marine and air transportation contribute a relatively small percent of transport emissions, but these values could grow owing to increasing international trade and the slow rate of improvements in fuel efficiency of these modes.

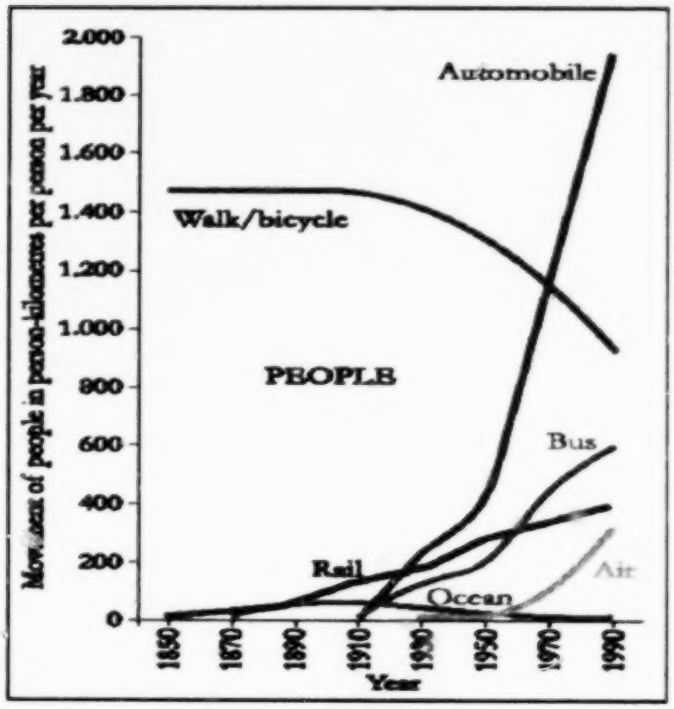
Figure III
Modal shares of transport CO_2 emissions, 2005



Source: International Transport Forum, Leipzig, 2008.

33. Figure IV describes the development of passenger transport since 1850 to date and clearly shows the decrease in walking and cycling versus the tremendous increase in automobile use.

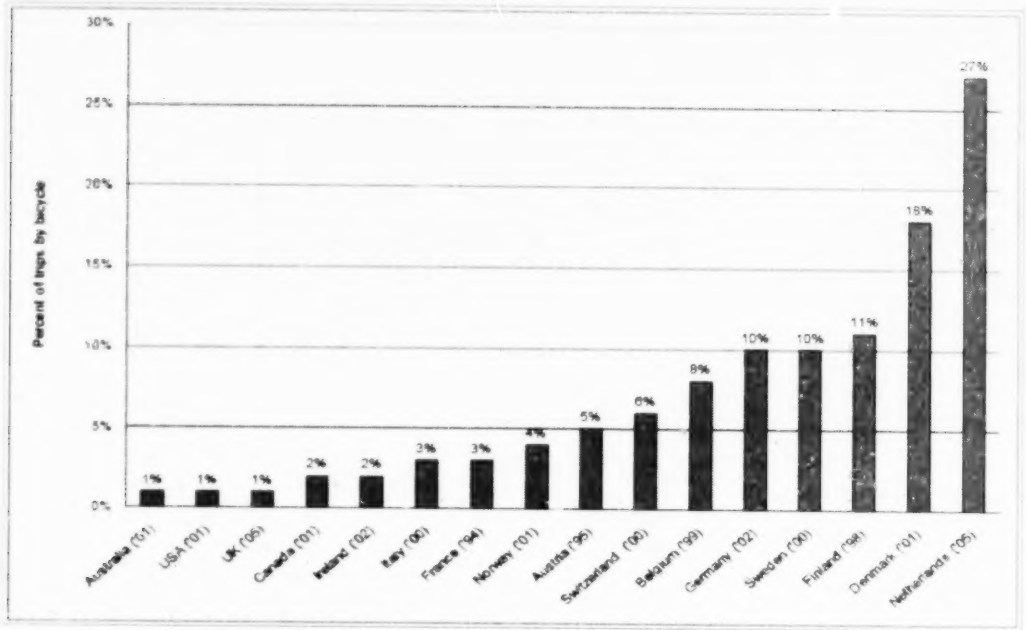
Figure IV
Changes in use of various transport modes over time



Source: Petersen, 2008.

34. Figure V shows a comparison of percentage of trips made by bicycle in various countries. While the mode share for most countries is quite small, an increase in bicycling is possible, especially through the application of policies supporting bike use. This would have many positive impacts on society such as improved health, fewer emissions, fewer vehicle miles travelled, reduced demand for parking spaces and less traffic congestion.

Figure V
Bicycle share of trips in Europe, the United States and Australia



Source: European Conference of Ministers of Transport, 2004.

D. Carbon dioxide emissions trends from transport sector

35. Transport sector emissions grew 1,412 million tons (31 per cent) worldwide between 1990 and 2003, increased 820 million tons (26 per cent) in OECD countries and 592 million tons (42 per cent) in non-OECD countries (IEA, 2005). CO_2 emissions from fuel combustion are growing faster for the transport sector than for other sectors. Furthermore, emissions are growing much more quickly in the developing world than in the developed world. Adequate transport infrastructure and services are essential for economic development and improving welfare. However, it is important to steer this development towards more sustainable patterns in order to curtail emissions.

36. Transport's share of CO_2 emissions is gradually increasing in all regions of the world; its share of world emissions increased from 22 per cent in 1990 to 24 per cent in 2003. Transport's share is higher in the more developed countries of OECD (30 per cent in 2003) than in non-OECD countries (17 per cent in 2003).

37. Increases in CO_2 emissions have been seen in all transport modes, but particularly in road transport. Although CO_2 emissions from road transport are increasing, aggregate figures for Europe suggest that greenhouse gas emissions have increased at a slower pace than the number of passenger and freight kilometres (European Environment Agency, 2008). That is to say, although road passenger kilometres are increasing, fuel efficiency per passenger kilometre is improving.

However, improvements in energy efficiency of vehicles and non-fossil fuels are still not enough to counteract the increase in transport demand. Therefore, measures focused on reducing transport demand, or shifting demand to more sustainable modes of transportation are extremely important to provide significant emissions reduction results.

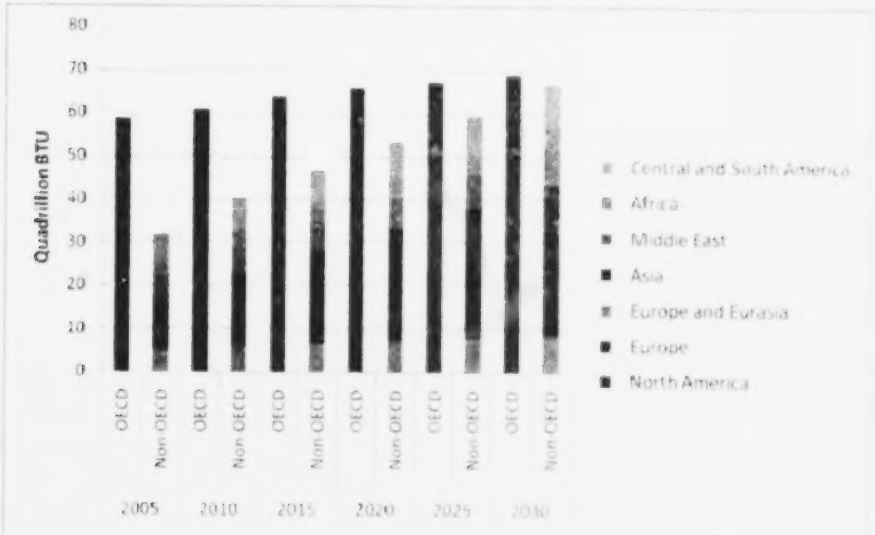
E. Transport sector forecasts

38. Future scenarios project a dramatic increase of global transport volume, and personal transport activity is expected to grow globally at an average annual rate of 1.6 per cent per year up to the year 2030 (World Business Council for Sustainable Development, 2004). However, this differs from region to region, depending on existing policies, income projections, expected availability of new technologies and — last but not least — population growth and urbanization rates, which are high in almost all emerging cities in developing and transition countries.

39. Energy consumption by the transportation sector is increasing much faster for non-OECD countries than for OECD countries, and this trend is expected to continue. Forecasted values of energy consumption by the transportation sector can be seen in figure VI. On average, transportation energy consumption is projected to increase by 0.7 per cent per year between 2005 and 2030 for OECD countries, while the increase for non-OECD countries is projected to be 3 per cent per year. The main driver of this growth is non-OECD Asian countries, which are expected to have a transportation energy consumption increase of 4.1 per cent per year. The United States has the highest transport energy consumption rate of any country.

40. In most countries, the majority of emissions within the transport sector comes from road transport. Road transport includes both private and commercial, however, private transport generally contributes a larger share of emissions. Looking at either OECD countries or European Union countries, the split between transport emissions is two thirds from passenger transport and one third from freight. However, emissions from freight have been growing at a faster rate than for passenger transport and this trend is expected to continue.

Figure VI
Energy consumption by the transportation sector

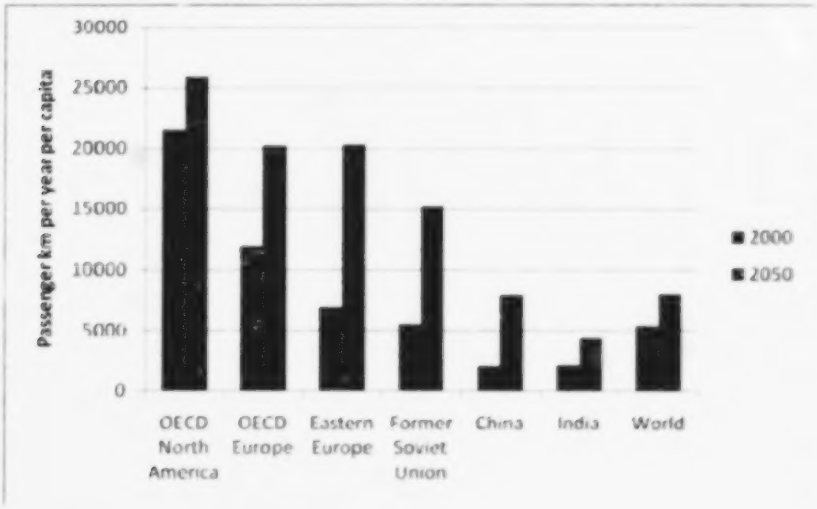


Source: Energy Information Administration, 2007.

F. Per capita passenger kilometres

41. According to European Environment Agency (2008) projections, worldwide per capita passenger-km travelled per year is expected to increase 48 per cent between 2000 and 2050 (see figure VII). This increase is even more dramatic in China (279 per cent), Eastern Europe (193 per cent) and the former Soviet Union (174 per cent). However, it should be noted that fuel economy of new cars sold in emerging economies is actually quite high. In China and India, the average performance of new cars already matches or exceeds United States targets for 2020 (International Transport Forum, Leipzig, 2008). This is mainly attributable to the small size and low power of cars used in these countries. Nevertheless, growing demand for cars outweighs the environmental benefits from efficiency improvements.

Figure VII
Per capita passenger kilometres per year in 2000 and projected for 2050



Source: European Environment Agency, 2008.

G. Recommendations

42. It is possible to change travel patterns and reduce transport emissions while still providing access and mobility by organizing transport and land use in an efficient way and applying transport policies that facilitate an efficient use of transport. Typically technical solutions, mainly new vehicle and fuel technologies, are the first choice of decision makers and non-technical solutions, such as policy, regulation, pricing, and support of efficient driving are seen as less important. There is no question that technological innovations are part of the solution. However, technical solutions alone cannot initiate the paradigm shift in transport planning needed to change mobility in our cities to reduce climate change. Reductions in vehicle and passenger-km travelled are needed in order to achieve reductions in transport emissions globally. Therefore, behavioural change in our cities is required.

43. It is important for both the developing and developed world to commit to making changes. Wealthy societies must find their way towards far less energy-intensive social and economic structures, including changes of individual lifestyles and behavioural patterns. In developing countries, where per-capita energy consumption is generally still quite low, it will be necessary to find strategies for economic growth and societal prosperity that do not require the high level of energy consumption associated with the Western lifestyle.

44. The following recommendations to counteract the current trend in transport development and begin the process of reducing transport sector emissions worldwide generally fall into the three categories set out below:

1. **Travel demand reduction: reduce the amount of passenger kilometres travelled and freight ton-kilometres travelled**

45. **Create land use plans** supporting the new need for people to live near central areas, in satellite cities or along well-served public transport corridors. Plans should encourage development in these areas, improved pedestrian and bicycle infrastructure and improved public transit service. Encouraging people to live near transit will enable them to satisfy all of their daily needs (such as going to work, going to medical appointments, shopping and running errands) by using public transportation, walking or biking, rather than using a car. This will reduce passenger-km travelled, improve efficiency of trips, encourage social interaction, provide exercise, create more vibrant neighbourhoods and reduce emissions.

46. **End fuel subsidies where they exist and apply auto fuel taxes** where they do not already exist. Fuel subsidies only encourage driving. They should not be used in any future transportation policies. Conversely, charging more for fuel such as through fuel taxes will encourage more efficient driving behaviour. Drivers will be more conscious about how often and how far they drive because of their increased fuel costs. This could motivate them to drive less or choose other transport modes. In addition, since the auto fuel tax is paid directly by drivers, it can be adjusted to reflect the costs of environmental damage and health impacts from driving. Furthermore, the revenue from the tax can be used to support measures that counteract these negative effects.

2. **Transport system shift: shift urban mobility from less sustainable travel modes towards transport modes with fewer emissions per passenger kilometres/ton-kilometre**

47. **Create an urban policy consisting of coordinated elements** that work together to produce cumulative long-term effects which attain a balanced set of environmental, social and economic goals. This should include combining pricing policies directed at car users with public transit improvements in order to encourage a modal shift from cars to more sustainable modes of transport. These pricing policies should reflect the costs of environmental damage and health impacts and should include differentiation between peak and off-peak hours as well as congested and non-congested areas. Pricing strategies include congestion pricing, charging on the basis of vehicle miles travelled and charging for parking. While these policies will make driving less attractive, it is important to make other modes more attractive in order to encourage a modal shift. Therefore, improvements to public transportation should be made simultaneously and can even be paid for using money collected from the pricing strategies. Improvements to public transit can include fare reductions and service improvements such as increased speed and reliability.

48. **Coordinate intervention at both the local and national decision-making levels.** It is important to coordinate plans so that they do not run in opposition to one another. Transportation and land use plans are stronger when they are coordinated to work together. In addition, some decisions can only be made at one level (either local or national) so it is important to communicate when changes are needed at the other level.

49. **Increase diesel tax rates** to discourage freight shipping by trucks and encourage more fuel efficient modes like trains. As mentioned, emissions from freight are growing even more quickly than emissions from passenger transport.

Increasing diesel tax rates could encourage a shift to more sustainable modes of freight shipping in addition to improved logistics to reduce vehicle miles travelled. In addition, if these increased shipping costs are passed on to consumers, it could affect consumer choice, encouraging shoppers to buy goods grown or produced closer to where they live, therefore reducing the average distance of transported goods.

50. **Limit the number of motorcycle registrations allowed and promote electric bikes** as a clean alternative in areas with clean electricity production (not coal power plants). A more sustainable alternative to motorcycles are electric bikes. These can be used in bike lanes, have slower speeds and therefore would reduce severity of accidents, are less expensive, and in areas with clean electricity production would produce fewer emissions.

51. **Promote non-motorized transport such as walking and biking**. Walking and biking produce no emissions, so it is beneficial to promote these modes whenever possible. Strategies include improving bicycle and pedestrian lanes, adding amenities (such as bike parking stations, benches, street trees, lighting), providing events such as car-free days (based on Ciclovia in Bogotá), providing trainings on how to use and repair a bike, initiating a bike-share programme (such as Velib in Paris), and initiating a marketing campaign to highlight the benefits of biking and walking (both environmental and health related).

52. **Join and support sustainable urban transport initiatives such as the Global Alliance for EcoMobility**. The Global Alliance for EcoMobility internationally advocates ecomobility systems that meet local accessibility needs and improve health, safety, security, air quality and social inclusion, and reduce road congestion and noise levels, resource and energy consumption and greenhouse gas emissions. Ecomobility encompasses an integrated form of environmentally sustainable mobility that combines the use of non-motorized means of transport (walking, wheeling, cycling) with the use of public transport to allow people to move in their local environments without utilizing privately owned motor vehicles. The EcoMobility Alliance membership consists of leading global and regional organizations representing four different categories of stakeholders: businesses, governmental organizations, users and experts. Together key global players have the capacity to build an ecomobility industry that benefits human well-being as well as global economies.

3. Transport technology improvements: improve performance of transport modes by making engines and vehicles which make a more efficient use of fuel and shift from fossil to alternative fuels with reduced or zero-carbon content. These recommendations are general and should be tailored to fit each local situation

53. **Apply fuel economy standards** in order to improve fuel economy of vehicles. Applying standards will encourage auto-makers to improve efficiency of vehicles. Possible improvements include making vehicles lighter and smaller (while maintaining safety), improving powertrain efficiency, and further developing alternative technologies such as hybrid and fuel-cell vehicles.

IV. Waste

54. The present section reviews the progress and identifies the difficulties, barriers and challenges in the implementation of the commitments and goals on waste management articulated in Agenda 21.

A. Background

55. Population growth and a paucity of effective communications pose major challenges for a society driven by aspirations of ceaseless consumption. Society's profligate use of resources (and consequent generation of waste) represent the antithesis of sustainability.

56. A global survey (Asahi, 2009) of more than 750 environmental experts around the world disclosed "extreme concern" for human survival prospects. Almost a quarter of respondents placed waste-related problems within the top three risk factors.

57. Growing industrial metabolism (consumption of resources to create products which become waste) is a major driver of global environmental change. Krausmann and others (2009) reported that during the last century, materials use increased eightfold. We consume almost 60 billion tons of materials every year.

58. The second half of the twentieth century was characterized by rapid physical growth, driven by population and economic growth. Materials use increased at a slower pace than the global economy, but faster than world population. So, material intensity (mass of materials required per unit of GDP) declined, while per capita materials use doubled from 4.6 to 10.3 tons per person per year. Relative dematerialization has occurred, although this has not translated into reductions of materials use.

59. Global waste arisings are predicted by some to double in the next 20 years (Jones, 2009). Industrialized nations are believed to spend around $120 billion per year managing municipal waste, and a further $150 billion on industrial wastes.

60. Since 1980, global resource extraction by mass increased by 36 per cent, and is expected to grow to 80 billion tons in 2020 (OECD, 2008). Growth rates and extraction intensities vary by material categories and among world regions, reflecting different levels of economic development and endowment in natural resources, varying trade patterns and industrial structures, and different socio-demographic patterns. Of course virtually all these extracted resources become waste relatively quickly.

61. OECD countries figure substantially in both global resource use and raw materials supply, although non-OECD economies, especially Brazil, the Russian Federation, India, Indonesia, China and South Africa are approaching OECD levels.

62. Across the world 3.4-4.0 billion tons of solid waste were generated in 2006 (see table), of which less than 3 billion tons were collected. Clearly, this means that perhaps 1,000 million tons of waste per year are completely unmanaged.

Estimated global waste generation and collection in 2006
(Billion tons per year)

Waste type	*Waste generated*	*Waste collected*
Total municipal	1.7-1.9	1.24
Non-hazardous industrial	1.2-1.67	1.20
Hazardous industrial[a]	0.49	0.3
Total	**3.4-4.0**	**2.74**

[a] Selected countries.
Source: Cyclope (2009).

63. In line with continuously growing global demand for raw materials, the amount of waste being generated by economic activity has been rising (OECD, 2008).

64. Consequently, many valuable material and energy resources are being wasted, and/or disposed of, and thus are lost to the economy. This has consequences for both the efficiency of material use and for the quality of the environment in terms of land use, water and air pollution, and greenhouse gas emissions.

65. Data collated by Cyclope (2009) gathered from several international sources show that many countries are still far too reliant on landfill disposal for municipal waste. However, there is a growing number of excellent examples of policies and practices in place to recover materials and energy from this waste stream.

B. Urbanization and waste management

66. For the first time in history, most people now live in urban areas. Every two seconds, another person joins the planet's expanding urban population. Many of the new urbanites will be poor. Their future, the future of cities in developing countries, the future of humanity itself, all depend on decisions made now in preparation for this growth.

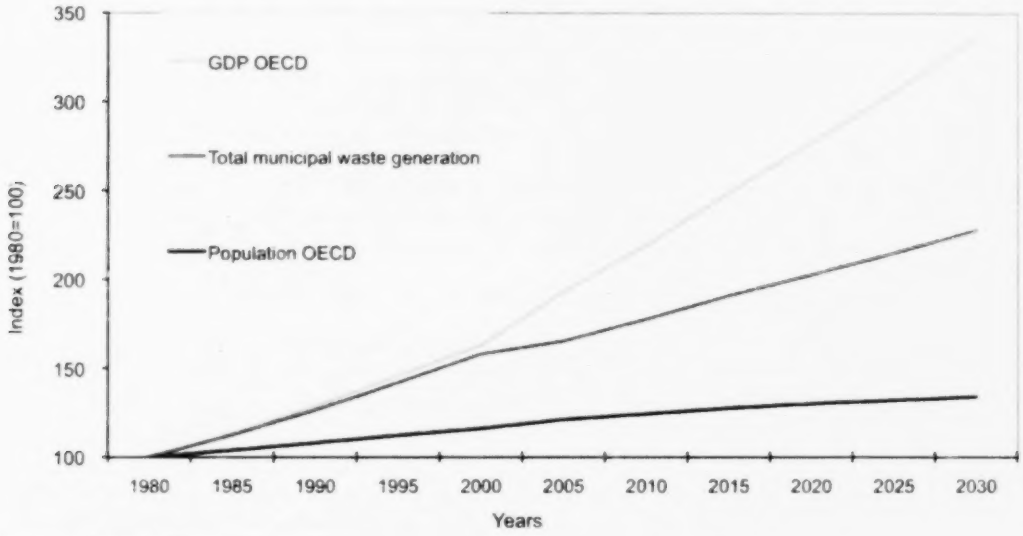
67. By 2030, the towns and cities of the developing world will make up 81 per cent of urban humanity. Most of the world's largest cities will also be located in less developed countries. According to UN-Habitat (2006), there will be 22 megacities with 10 million or more inhabitants by 2015. Only six of these megacities will be located in OECD countries.

68. The greater the population density, the more challenging it will be to manage these wastes. The richer the nation becomes, the more waste its industry, commerce and people tend to create. Breaking the link between prosperity and waste creation — decoupling — is notoriously difficult, though some countries are showing partial decoupling (waste arisings increasing less rapidly than the economy).

1. Municipal solid waste

69. Figure VIII shows evidence of partial decoupling, where municipal solid waste arisings are growing, but less rapidly than the economy (as GDP). However, it is clear that this slight optimism may be attributable to the forecasting models used.

Figure VIII
Trends in population, gross domestic product and municipal solid waste arisings across the Organization for Economic Cooperation and Development



Source: OECD, 2008.

70. Inorganic urban solid waste is a serious problem in developing countries, and its inadequate final disposal causes serious environmental effects (Muñoz-Cadena and others, 2009).

71. CO2 emissions attributable to United Kingdom households were 15 per cent above 1990 levels in 2004 (Druckman and others, 2009). Expanding lifestyle aspirations appear to be significant factors in driving household CO2 emissions. The findings highlight the scale of the challenge facing policymakers, and suggest that policies should be targeted towards segments of society responsible for the highest carbon footprints.

72. Proper understanding of the link between environmental concerns and good waste management is vital, particularly in cities in developing countries where there is widespread illegal dumping. Tadessea (2009) reported that in the Ethiopian city of Mekelle, waste arisings, attitudes of households, proper use of waste containers and container distance from houses were each positively linked to concern for the environment.

73. Municipal solid waste management will continue to be a major issue facing countries worldwide, particularly true for developing countries where arisings of municipal solid waste have increased dramatically with rapid industrialization and urbanization. Chen and others (2009) report that China produced 190 million tons of municipal solid waste in 2004, and became the world's largest generator of such waste. It is true that China has devoted considerable effort to managing its municipal solid waste. From 1990 to 2004, investment in municipal solid waste treatment equipment and infrastructure increased 21 times and over 30 times more municipal solid waste is now treated or disposed of safely. However, as safe

disposal in 1990 was highly limited, the safe disposal rate reached only 53 per cent in 2006 and challenges remain.

2. Hazardous waste

74. Although reliable data are difficult to obtain, best available estimates suggest that the amount of hazardous waste generated in OECD countries was some 115 million tons in 1997, or 2.5 per cent of total waste (OECD, 2001). That amount may have increased slightly in the period from 1997 to 2001. Within that period, 19 OECD countries reported increased generation of hazardous waste, 3 reported decreased generation, 3 reported no change, and 5 provided no data. At the same time, GDP increased by 18 per cent and industrial production grew by 19 per cent (OECD, 2005). In the European Union member States, hazardous waste generation increased between 1998 and 2002 by 13 per cent (Eurostat, 2005).

3. Transboundary movements of waste

75. OECD (2008) reports that illegal shipments of end-of-life materials and products are rather common. For example, one study found that 51 per cent of inspected transboundary movements of waste within and from the European Union area were illegal between 2004 and 2006 (IMPEL, 2006). While some illegal shipments from European Union countries stay within Western Europe, many go to developing regions, such as Africa and Asia. The most prominent reasons for these illegal shipments seem to be the lack of enforcement and the high costs of treatment or disposal in the exporting country (IMPEL, 2005).

76. Although very little is known about the actual volume and number of illegal shipments, OECD (2008) declared that their environmental and health impacts may be considerable. In order to be able to reduce these threats, effective compliance and enforcement of existing obligations, as well as increased border controls for shipments of end-of-life materials and products, should be considered.

4. Minimizing waste: prevention is better than cure

77. The Waste Framework Directive adopted by the European Council of Ministers in October 2008 lays down the five-step hierarchy of waste management options, with waste prevention as the preferred option, and then reuse, recycling, recovery (including energy recovery) and safe disposal, in descending order. The Directive defines prevention as:

> 12. ... measures taken before a substance, material or product has become waste, that reduce:
>
> (a) the quantity of waste, including through the re-use of products or the extension of lifespan of products;
>
> (b) the adverse impacts of the generated waste on the environment and human health;
>
> (c) the content of harmful substances in materials and products.

78. The Directive also explicitly encourages prevention of waste. Member States must design and implement waste prevention programmes, and the Commission is set to report periodically on progress concerning waste prevention.

79. Waste prevention is increasingly incorporated into national, regional and local policy initiatives (Strange, 2009). There are clear legal definitions of waste prevention, although implementation is more vaguely defined, often expressed in terms of increasing recovery or decreasing landfill dependency.

80. Despite claims to the contrary, it is very difficult to demonstrate a consistent, direct link between specific policy instruments and measurable waste prevention achievements. However, there is a body of evidence suggesting that a broad mix of waste prevention measures does deliver dematerialization, detoxification and associated resource efficiency goals. The most effective and most frequently applied suite of waste prevention instruments appear to comprise:

- Waste prevention targets
- Producer responsibility
- Variable rate charging (pay as you throw) systems for householders' residual waste
- Intense public awareness/communications campaigns
- Public sector funding pilot projects
- Collaboration between public, private and third sectors.

81. The evidence suggests that effective combinations of these instruments can reduce the quantities of household waste by more than 10 per cent, and that individual waste prevention measures tend to become effective where more than 15 per cent of the population supports them.

82. A few European countries have taken early steps to embrace household waste prevention measures. The elite group of nations in this regard would include Austria, Belgium and France. There are also many interesting examples of relevant initiatives seen in Australia, Canada, Japan and New Zealand.

83. Examples of the most effective waste prevention ideas (apart from the policy initiatives listed above) gleaned from overseas experiences include:

- Choosing "emblematic" (high profile) streams (e.g., plastic shopping bags, bottled water, home composting or junk mail) to lead the wider waste prevention debate
- Explaining to the public the link between waste and sustainable consumption
- Making second-hand purchases and renting more the social norm
- Empowering householders/consumers to make a difference (e.g., Local Agenda 21)
- Implementing specific short-term campaigns and pilot projects, together with long-term awareness-raising campaigns
- Addressing schools, offices and shops — this is important even when it is household waste prevention which is being targeted, as both schoolchildren and working people are also members of households.

84. Raimo (2009) analysed the process of preparing the new Finnish National Waste Plan (2007-2016), based on the use of the alternative concepts of waste prevention or material efficiency. The author concludes that waste prevention can be

promoted just as well, or even better from the perspective of improving material efficiency.

85. An encouraging initiative is the Regional 3Rs Forum in Asia financed by Japan's Environmental Ministry and launched in November 2009. It involves Governments, donor agencies and scientific institutes in a dozen Asian countries.

86. With support from the Japanese Government, it aims to promote policy development and projects on the 3Rs. The 3Rs refer to restricting generation (Reduce), promoting reuse (Reuse) and regeneration (Recycle) of wastes, and represent the concept of balancing environmental conservation and economic growth through the effective use of resources.

5. Maximizing environmentally sound waste reuse and recycling

87. Communities across Canada have achieved high waste diversion rates through a comprehensive approach based on four keys to success:

(a) Partnerships and collaboration can be generated with local citizens, organizations, educational institutions, the private sector and the provincial or territorial government;

(b) Convenient options for reuse, recycling and composting can include kerbside collection or drop-off centres. The more widely these options are available (to residents in single-family households and multi-family buildings and to the institutional, commercial and industrial sectors) the easier it is to reach a high diversion rate;

(c) Policy and legislation that support waste diversion efforts are essential. Municipal by-laws limiting waste disposal, charging for garbage collection or banning divertible materials from landfills can help enforce waste diversion practices. Broader policies, such as formal provincial or municipal waste diversion targets, can also motivate change;

(d) Education and promotion is a key element in any waste diversion strategy. The public needs to be informed about waste diversion programmes and how to participate effectively. Programmes can range from visits to residences to educate people about a recycling programme, to targeted promotional strategies that encourage and reward waste diversion activities (such as backyard composting).

88. The municipal solid waste management significantly contributes to the emission in the atmosphere of greenhouse gases (e.g., CO_2, methane, nitrous oxide) and so waste management from collection to treatment and disposal should be optimized to reduce these emissions.

89. Calabrò (2009) reports that separate collection approach can have a significant effect on the emission of greenhouse gases and the adoption of best available technologies can not only significantly reduce greenhouse gas emissions but, in certain cases, can also make the overall process a carbon sink.

90. Owing to initiatives such as the clean development mechanism, reducing greenhouse gas emissions for a developing country can offer an important route to attracting investment in a variety of qualifying project areas, including waste management. The opportunity for developing clean development mechanism projects to attract investment to improved waste management infrastructure is

significant. Barton and others (2008) report that Kyoto credits in excess of one ton CO_2 equivalent per ton of waste could be realized.

6. Promoting environmentally sound waste disposal and treatment

91. Municipal solid waste management is one of the major environmental problems of cities in poorer nations. The management of municipal solid waste in India is going through a critical phase (M. Sharholy and others (2008)), owing to the lack of suitable facilities to treat and dispose of the increasing amount of municipal solid waste generated daily in metropolitan cities. The collection of municipal solid waste is the responsibility of municipalities.

92. The predominant system of collection in most Indian cities is through communal bins placed at various points along the roads, and sometimes this leads to the creation of unauthorized open collection points. Efforts to organize house-to-house collection are just starting in many megacities such as Delhi, Mumbai, Bangalore, Madras and Hyderabad with the help of non-governmental organizations.

93. To minimize the environmental impacts of selective collection of municipal solid waste in densely populated poorer urban areas, Iriarte and others (2009) suggest that the following key actions should be evaluated:

- Increase the efficiency of inter-city transport by locating recycling/disposal facilities at shorter inter-city distances
- Integrate recycling/treatment facilities within urban industrial estates.

94. Continually increasing amounts of municipal solid waste and the limited capacity of the existing waste management system in Phuket, Thailand, have led to the consideration of integrated waste management systems. Liamsanguan and others (2008) report that life cycle assessment has been employed to compare the greenhouse gas emissions from the existing waste management system and three alternatives for Phuket municipal solid waste. The study suggests that a policy that promotes source separation should be pursued, preferably combined with the application of landfill gas recovery for electricity. Policy promoting recycling is favourable over anaerobic digestion if both treatment systems could not be established at the same time. The major conclusion from the study is that results from the life cycle assessment can support Phuket Municipality for decision-making.

95. In Singapore, significant reduction of global warming impacts can be realized by implementing food waste anaerobic digestion (Khoo, and others, 2009).

96. The past couple of decades have seen the reintegration of resource management into public cleansing in industrialized countries (Scheinberg and Wilson, 2010). This is the origin of the idea of an "integrated" waste management system, which again, as in the nineteenth century, includes source separation, repair and reuse, collection, processing, composting, transfer, marketing of materials recovered from waste, and land or thermal disposal of the residues.

97. In low- and middle-income countries, this process is happening 20 to 30 years later, in a period of extreme globalization. In cities, the commons are shrinking as more people claim space, and what remains is crowded areas, flowing with waste.

7. Electronic waste — a hazardous resource

98. Current global production of electronic waste (e-waste) is estimated to be 20-25 million tons per year, with most e-waste being produced in Europe, the United States and Australasia. China, Eastern Europe and Latin America will become major e-waste producers in the next 10 years (Robinson, 2009).

99. E-waste contains valuable metals (copper, platinum group) as well as contaminants. Burning e-waste may generate dioxins, furans, polycyclic aromatic hydrocarbons, polyhalogenated aromatic hydrocarbons, and hydrogen chloride. Most e-waste is disposed in landfills.

100. Effective reprocessing technology, which recovers the valuable materials with minimal environmental impact, is expensive. Consequently, although illegal under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, rich countries export an unknown quantity of e-waste to poor countries, where recycling techniques include burning and dissolution in strong acids, with few measures to protect human health and the environment. Such reprocessing initially results in extreme localized contamination followed by migration of the contaminants into receiving waters and food chains.

C. Recommendations

101. In many parts of the world, the way in which wastes are managed has moved beyond the avoidance of hazards to public health, through recovering some value from the materials or energy content of waste. Now it is more important to develop integrated systems of management that seek to increase resource efficiency, to counter climate change threats and to become more sustainable. There is inevitably a lag between what the richest and poorest countries in the world can achieve, though there are necessary lessons to be learned from all. The following recommendations are brought forward here:

1. Local authorities to guide behavioural change

102. Local authorities have always had important responsibilities for the wastes created by householders and also for some industrial, commercial and public sector institutions. As the world's population continues to grow, to become more urban and perhaps wealthier, local authorities will have to become even more heavily engaged in waste management. They will also play a vital role in guiding the changes in behaviour which are essential if society is to become more sustainable.

2. Enable local authorities to act

103. The international community should create an enabling environment for local authorities for conducting environmentally sound waste management. The way local authorities manage waste, will affect the international community considering the export of waste and population's migration.

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